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(56) Documents Cited

US 4269791 A US 4206753 A US 4049402 A
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2051068 C1

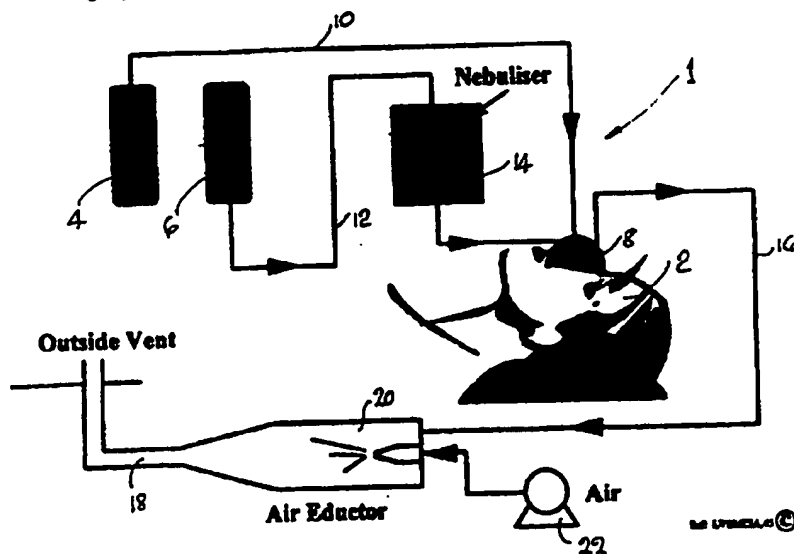
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Online: WPI, CLAIMS

(54) Abstract Title

Breathable gas mixture and apparatus for delivering it

(57) Apparatus for delivering a breathable gas mixture of hydrogen and oxygen to a patient comprises a source 6 of oxygen connected to a first conduit 12 for delivery of oxygen to a gas mixing chamber via a humidifier 14 and a separate source 4 of hydrogen connected to a second conduit 10 for delivery of hydrogen to the chamber. The mixing chamber may be arranged within a facial breathing mask 8 and has a demand valve which opens on inspiration of the patient. The gas mixture may comprise 40-95 % by volume oxygen with the remainder being hydrogen.



GB 2 331 707 A

MEDICAL APPARATUS AND BREATHABLE GAS MIXTURES

The present invention relates to breathable gas mixtures for delivery to a patient and apparatus for delivering said mixtures.

When patients become critically ill with asthma or other lung related complaints it is advantageous to be able to supply them with a low viscosity oxygen containing gas mixture to maintain life while other drugs being administered to the patient have time to take effect to control the attack. Asthma and other lung-related complaints occasionally become life threatening and at this stage it is essential to maintain body oxygen levels via inspiration. Asthma is characterised by constriction and wall thickening in the bronchioles and although this condition can be relieved medically, the drugs involved take time to have an effect. During this very critical period it is essential that the lungs continue to supply oxygen to the blood stream and it is known to use gas mixtures such as oxygen/helium gas mixtures which aid in the diffusion of gases.

A better mixture would be one containing between 40 to 95% by volume oxygen with the remainder being hydrogen. However, this gas mixture is highly dangerous and known to be explosive and therefore could not be supplied safely to a patient because of the dangers associated with such a mixture.

* { It is an aim of the present invention to make a gas mixture of oxygen and hydrogen therapeutically available to the patient while at the same time reducing the risks of ignition and explosion to a level which would be acceptable in a patient life and death situation.

According to one aspect of the present invention, a method of delivering a breathable gas mixture containing hydrogen and oxygen to a patient comprises the steps of supplying oxygen from a source of oxygen to the patient and separately supplying hydrogen from a source of hydrogen to the patient.

In a preferred embodiment the oxygen and the hydrogen are supplied to a space immediately adjacent the patient such that the oxygen and hydrogen are mixed in said space ready for inhalation by the patient.

Preferably the mixture consists from 40 to 95% by volume oxygen the remainder being hydrogen.

According to a further aspect of the present invention an, apparatus for delivering a breathable gas mixture containing hydrogen and oxygen to a patient comprises a source of oxygen connected by a first conduit for delivering said oxygen to a gas mixing chamber, a source of hydrogen connected to a second conduit for delivering the hydrogen to said gas mixing chamber, the gas mixing chamber having at least one demand valve which on inspiration of the patient will open allowing the gas mixture in the gas mixing chamber to be delivered to said patient.

An embodiment of the invention will now be described, by way of example, reference being made to the Figure of the accompanying diagrammatic drawing which is a schematic sketch of an apparatus for delivering a breathable gas containing hydrogen and oxygen to a patient according to the present invention.

As shown, apparatus 1 for delivering a breathable gas mixture containing hydrogen and oxygen to a patient 2 comprises a source 4 of the hydrogen and a separate source 6 of the oxygen. Source 4 is connected to a gas mixing space or chamber arranged within a facial breathing mask 8 by a conduit 10, and source 6 is connected to said gas mixing space or chamber by a separate conduit 12. Located in the conduit 12 intermediate the source 6 and the face mask 8 is a humidifier 14.

An expired gas line 16 extends from the mask 8 to a disposal vent 18 which is in communication with an air eductor 20 which in turn is in communication with an air pump 22.

In use oxygen and hydrogen are piped separately by the conduits 10, 12 to the facial breathing mask 8 and into the gas mixing chamber contained in said breathing mask. The oxygen is arranged to pass through a humidifier 14 to humidify the oxygen to a required extent. The oxygen and hydrogen are then mixed at the gas mixing space or chamber within the breathing mask 8. One or more demand valves (not shown) control the flow of the gas mixture from the gas mixing chamber to the patient. Said valve or valves opening in response to the inspiration of the patient.

Expired gas from the patient will be evacuated from the face mask 8 through the line 16 out via the vent 18. This disposal of the expired gas can be assisted by the air eductor 20 connected to the air blower 22. As is known in the art as the patient exhales the demand valves will close thereby maintaining the hydrogen/oxygen mixture in the gas mixing chamber.

Preferably, the air blower 22 is set to blow air into the exhaled gas mixture at a rate sufficient to reduce the hydrogen content to below the detonation threshold, that is, less than 4% by volume hydrogen.

It will be apparent that all materials used in the manufacture of the apparatus should be of anti-static type with any metal workbed and the patient properly earthed. Furthermore any instrumentation used in the vicinity of the patient should be built to a suitable flameproof standard.

Although reference has been made to the gas mixing chamber being located within the facial breathing mask it will be evident to the man skilled in the art that the gas mixing chamber could be located within a laryngeal breathing mask or within the patient's mouth as in a scuba diving mouthpiece.

It has been found that a breathable gas mixture comprises between 40 to 95% by volume oxygen with the remainder being hydrogen is preferred for asthmatic patients.

CLAIMS

1. A method of delivering a breathable gas mixture containing hydrogen and oxygen to a patient comprising the steps of supplying oxygen from a source of oxygen to the patient and separately supplying hydrogen from a source of hydrogen to the patient.
2. A method as claimed in claim 1, in which the oxygen and the hydrogen are supplied to a space immediately adjacent the patient such that the oxygen and hydrogen are mixed in said space ready for inhalation by the patient.
3. A method as claimed in Claim 2, in which prior to entry into said space the oxygen is passed through humidifying means.
4. A method as claimed in claim 2 or 3, in which the space is defined by a gas mixing chamber.
5. A method as claimed in claim 4, in which the flow of gas mixture from the gas mixing chamber towards the patient is controlled by at least one demand valve.
6. A method as claimed in any one of claims 1 to 5, in which the mixture consists of from 40 to 95% by volume oxygen, the remainder being hydrogen.
7. An apparatus for delivering a breathable gas mixture containing hydrogen and oxygen to a patient comprising a source of oxygen connected to a first conduit for delivery of said oxygen to a gas mixing chamber, a source of hydrogen connected to a second conduit for delivering the hydrogen to said gas mixing chamber, the gas mixing chamber having at least one demand valve which on inspiration of a patient will open allowing the gas mixture in the gas mixing chamber to be delivered to the patient.

8. An apparatus as claimed in Claim 7, in which a humidifier is located in the first conduit intermediate the source and the gas mixing chamber.
9. An apparatus as claimed in claims 7 or 8 in which a gas line is connected to the gas mixing chamber for the passage therethrough of gases expired by a patient.
10. A breathable gas mixture comprising from 40 to 95% by volume oxygen the remainder being hydrogen.
11. A method of delivering a breathable gas mixture containing hydrogen and oxygen to a patient substantial as hereinbefore described.
12. An apparatus for delivering a breathable gas mixture containing hydrogen and oxygen to a patient constructed, arranged and adapted to operate substantially as hereinbefore described with reference to and as illustrated in the Figure of the accompanying drawing.



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Application No: GB 9725030.2
Claims searched: 7-9 and 12

Examiner: L. V. Thomas
Date of search: 18 March 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.P): A5T (TAE, TAX, TBA, TBC, TDA)
Int CI (Ed.6): A61M 16/00, 16/10, 16/12; A62B 7/00, 7/02, 7/04; B63C 11/14, 11/18
Other: Online: WPI, CLAIMS

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 4269791 (HILLS) see col.2 l.58 - col.3 l.22 and col.3 l.56 - col.4 l.5	7
A	US 4206753 (FIFE) see col.1 ll.38-52 and col.2 ll.9-58	7

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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Application No: GB 9725030.2
Claims searched: 10

Examiner: L.V.Thomas
Date of search: 11 August 1998

Patents Act 1977
Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.P): A5T (TDA); C1A (AVG5)
Int CI (Ed.6): A62B 7/00; B01F 3/02; B63C 11/18; C01B 3/00, 3/02, 13/00
Other: Online: WPI, CLAIMS

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 4049402 (FORTSON) see col.1 ll.11-46 and col.6 ll.20-31	10
A	WPI Abstract Acc. No. 96-400577/199640 & RU 2051068 C1 - see abstract re "Use/advantage"	10

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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